Modicon TSX Momentum

FIPIO Comm Adapter

User Manual

870 USE 005 00

11/97

GROUPE SCHNEIDER

■ Merlin Gerin ■ Modicon ■ Square D ■ Telemecanique

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Preface

- Verwendete Symbole
- Begriffe und Abkürzungen
- Zusätzliche Dokumentation
- Gültigkeitshinweis

Caution

The relevant regulations must be observed for control applicatons involving safety requirements.

For reasons of safety and to ensure compliance with documented system data, repairs to components should be performed only by the manufacturer .

Terminology

Note
This symbol emphasizes very important facts.

Caution
This symbol refers to frequently appearing error sources.

Warning
This symbol points to sources of danger that may cause financial and health damages or may have other aggravating consequences.

Expert
This symbol is used when a more detailed information is given, which is intended exclusively for experts (special training required). Skipping this information does not interfere with understanding the publication and does not restrict standard application of the product.

Tip
This symbol is used for Tips & Tricks.

Example

This symbol emphasizes the begining of an example.

Figures are annotated in the spelling corresponding to international practice and approved by SI (Systéme International d Unités).
The notation applied to numerical values conforms to international practice, as well as a SI (Système International d Unités) sanctioned representation. This

notational format requires a space between hundreds and thousands, and the use of the decimal point (For example: 12 345.67).

Dieses Symbol kennzeichnet den Menüpfad.

Related Documents

Title	Order No.
Modicon TSX Momentum I/O Bases User Manual	870 USE 002 00
FIPIO bus/FIPWAY Networking Reference Manuel	TSX DR FPW E

Validity Reference

Refer to chapter 1, Presentation

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Presentation

1

This documentation covers the use (implementation and operation) of the discrete and analog input/output interfaces of the MOMENTUM product line with PLCs via the FIPIO bus.

The FIPIO 170 FNT 110 00 communication adapter lets you connect I/O bases of the MOMENTUM product family to the FIPIO bus. The FIPIO communication adapter permits the connection of the MOMENTUM products to the following PLCs:

PLC	TSX Telecontroller model 40 (version 5.5 and up)	APRIL CPU5030 and CPU5130 (version 2 and up)
Software house	XTEL V52 or V6 with diskette TXTRCTG V6 F	ORPHEE (version 6.2 minimum)

Operation of the MOMENTUM products with the XTEL software facility is described in Chapter 3; operation of the MOMENTUM products at ORPHEE is described in Chapter 4.

The following functionalities are available:

- I/O base parameter assignment (at start□up and in operation)
- Managing cyclic input and output data exchanges
- Processing diagnostic information

However, messaging operations are not available.

In the course of these descriptions the following terms are used:

Communication adapter

This refers to the module which lets you connect to the FIPIO bus. The product number is 170 FNT 110 00.

I/O base

This refers to the input/output module of the MOMENTUM family which connects to the communication adapter.

Module

refers to either the communication adapter or the I/O base.

Equipment

This refers to a device, a functional assembly constituted of a communication module connected to an I/O base.

Point of connection

address of equipment connected to the FIPIO bus

Hardware Implementation

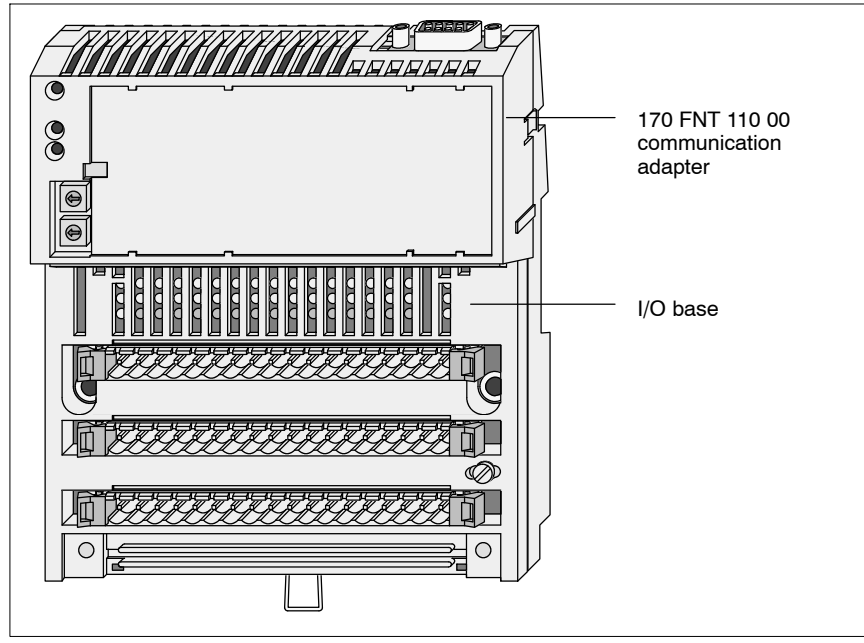
2

2.1 Physical Design

The FIPIO communication adapter is designed to connect to an I/O base of the MOMENTUM family.

Prior to operation the communication adapter and the I/O base must be assembled as shown in the following diagram:

Figure 1 Front view of a TSX Momentum I/O base with FIPIO Communication Adapter attached



For the assembly refer to the user manual 870 USE 002 00.

2.2 Power supply

Power is automatically supplied to the FIPIO communication adapter by the I/O base to which it is connected. For specifications and power-supply wiring instructions, refer to the I/O base set-up instructions (870 USE 002 00).

The 170 FNT 110 00 communication adapter is compatible with all I/O bases listed in the MOMENTUM catalog. It can be operated in conjunction with one I/O base only.

2.3 Connecting to the FIPIO bus

Several accessories are recommended to facilitate wiring the FIPIO bus:

- TSX FP ACC12 and TSX FP ACC2 connectors for connecting the equipment to FIPIO
- TSX FP CA/CRxxx main cable, commercially available in lengths of 100, 200 or 500 m
- TSX FP CCxxx drop cables commercially available in lengths of 100, 200 or 500 m
- TSX FP ACC4 junction box
- TSX FP ACC7 line terminator
- TSX LES 65 or TSX LES 75 connector for connecting to Series 7 controllers (PLCs), TSX models 40
- KIT5130 power cord for connecting the APRIL 5000 PLC

When installing MOMENTUM modules in a cabinet, using the TSX FP ACC2 connector for connecting to the FIPIO bus will permit optimal space utilization.

The following figure shows the dimensions of a standard I/O base connected to the FIPIO bus. The blank spaces indicate the minimum clearance required for adequate air circulation with any given type of network connector.

Figure 3 and Figure 4 show the dimensions of the appropriate connectors. If the ACC 12 connector is used, the clearance above the MOMENTUM must be 150 mm rather than 60 mm to leave space for the FIP cables (see Figure 4).

Figure 2 Dimensions (in mm)

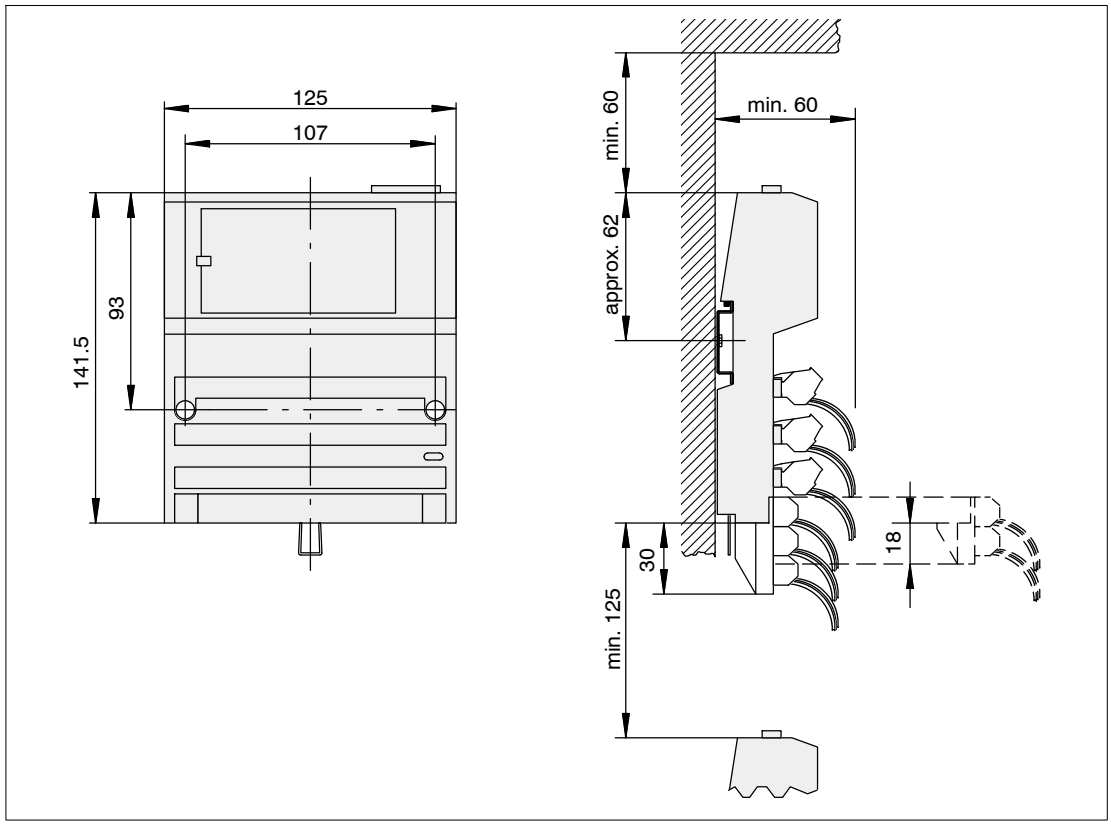


Figure 3 Connection using the ACC 2

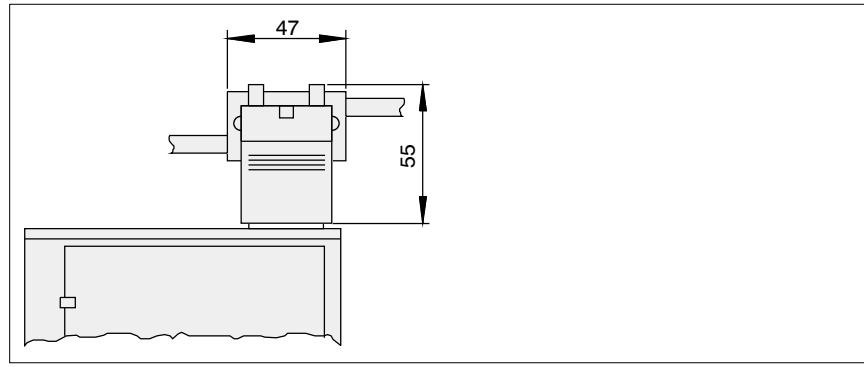
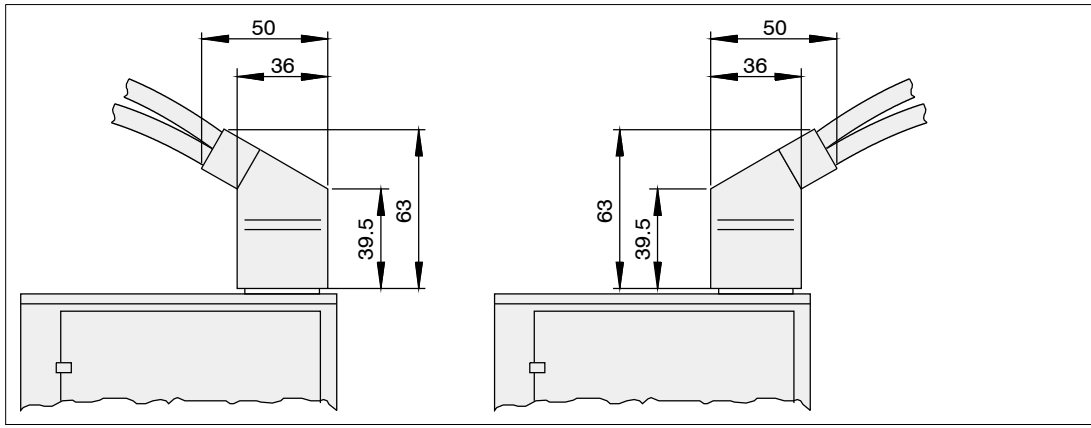


Figure 4 Connection using the ACC 12, option 1 and option 2



For further information on how to make the connection, refer to the FIPIO bus/FIPWAY networking reference manual, under TSX DR FPW E. The manual also provides details on the functional characteristics and the set-up of a FIPIO field bus.

In addition, the ground wiring guide TSX DG GND contains valuable installation do s and don ts for the wiring of a FIPIO field bus.

Caution

Make sure that for each line section the string of connectors is connected to protective ground at least at one point.

2.4 FIPIO equipment addressing

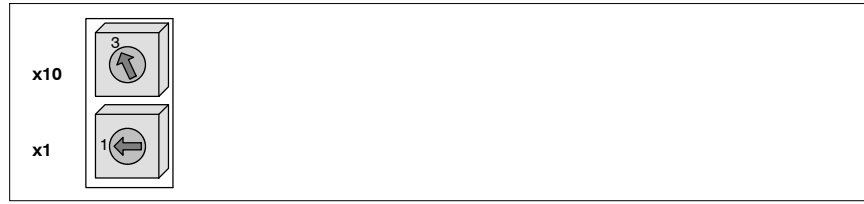
Equipment on the FIPIO bus is identified by its point of connection. The number of the point of connection represents its physical address on the FIPIO bus and can be a value between 1 and 62.

On the FIPIO, 0 is the address reserved for the PLC (TSX model 40 or APRIL 5000) which is the bus manager. Address 63 is reserved for the programming terminal.
If an address number greater than 62 is entered into the communication adapter, the equipment will be neither recognized nor controlled by the PLC.

The equipment FIPIO address assignment is performed with the aid of two adress switches provided on the communication adapter.

FIPIO addressing must be in decimal code.

Figure 5 Address coding 31



For changing an address, the equipment must first be powered down and then powered up again.

Caution

If the address is changed with the power on, it will cause an internal error and disconnection of the FIPIO bus.

Warning

Two equipment units on the FIPIO bus must never have the same address. When three LEDs (RUN, ERR, COM) keep blinking simultaneously , it indicates that the equipment cannot establish the connection to the FIPIO bus because its address is already occupied by another device.

2.5 FIPIO bus start□up procedure

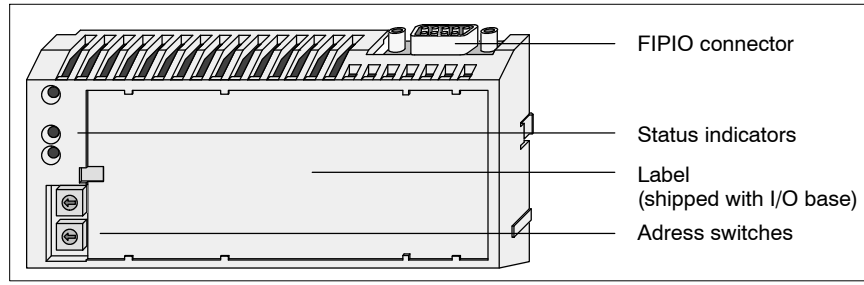
It is recommended that the equipment devices be brought on line one after the other. For a detailed description of the initial start□up of an application on FIPIO, refer to the FIPIO bus/FIPWAY network reference manual under TSX DR FPW E.

2.6 Description of the equipment status indicators

2.6.1 Display panel of the communication module

The FIPIO communication adapter of the MOMENTUM family features a display panel with three status indicators (RUN, ERR, COM) showing its operating status.

Figure 6 The 170 FNT 110 00 communication adapter



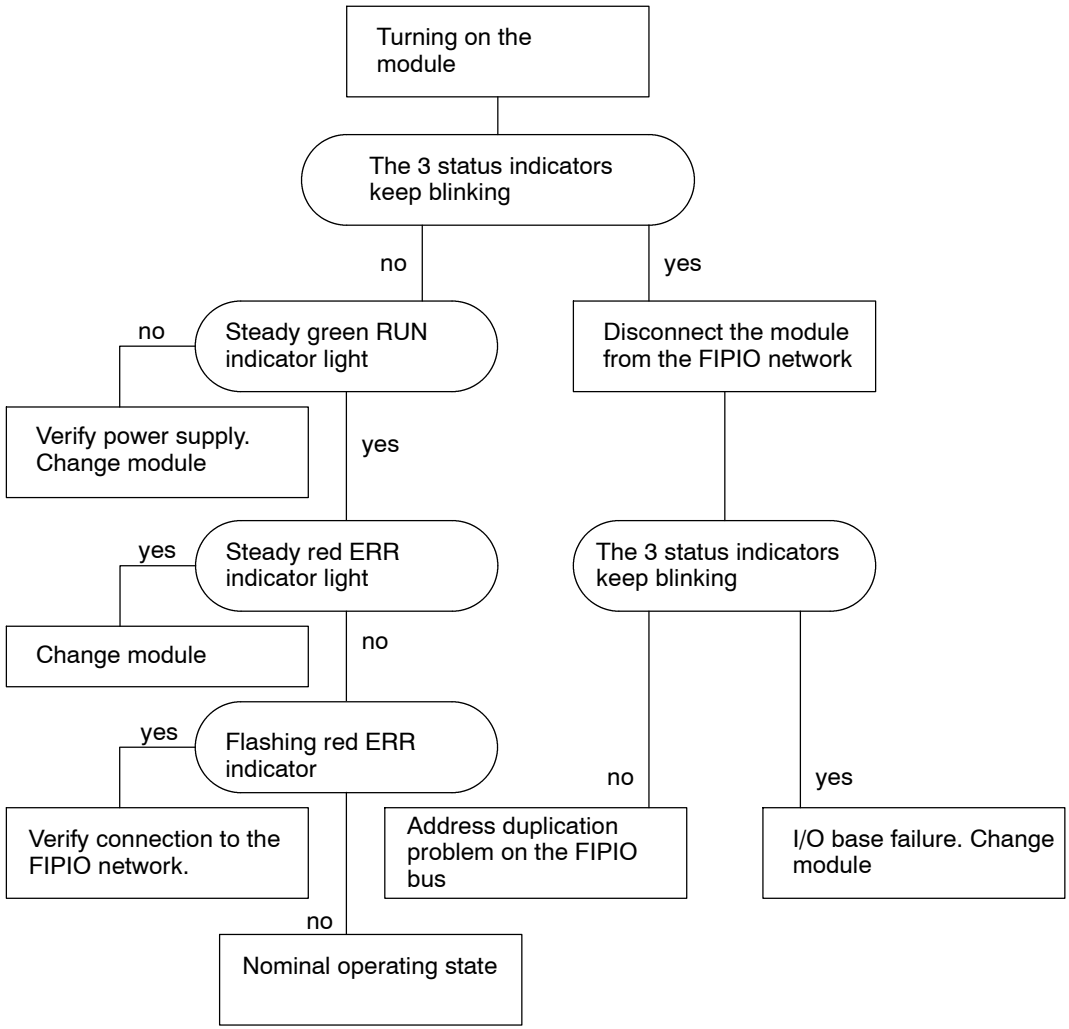
LED	Color	Meaning
RUN	Green	Equipment under power Off when the equipment is powered down or entirely out of operation. Blinks if the equipment cannot connect to the bus due to the presence of another device at the same address.
COM	Yellow	Communication activity status Off when the FIPIO bus is disabled or communication has stopped. Blinks during self-testing, initialization and equipment connection. Blinks also when communication is active.
ERR	Red	Major error Off during normal operation of the equipment. Blinks during self-tests, initialization and equipment connection, and for as long as the equipment is not properly connected to the FIPIO network. Lights up when there is a malfunction requiring replacement of the equipment or one of its constituent modules: Defective subassembly, combination of incompatible modules, etc.

Depending on the type of I/O base used, minor problems in the I/O base can be flagged by the status indicators on the I/O base itself. It will be helpful to refer to the documentation for the I/O base concerned to learn the meaning of its specific status displays.

Information on faults detected in the I/O base (for instance sensor power failure) is provided by the status indicators on the I/O base. For their location and meaning, refer to the operating manual of the I/O base used (870 USE 002 00).

2.7 Diagnostic algorithm

Figure 7 Diagnostic algorithm



2.8 Technical specifications

The common technical specifications for all equipment of the MOMENTUM series are contained in Chapter 5 of the I/O base operating manual (870 USE 002 00).

The adapter conforms to the environmental specification of the I/O base upon which it is installed. For environmental specification refer to the TSX Momentum I/O bases user manual 870 USE 002 00.

Specific details of the communication adapter	
Weight	66 g
Transfer rate	1 MB/s

2.9 Limitations

On S7 PLCs, the user can define several tasks wich all run the user s program concurrently.

For more details, see the S7 PLCs user s manual: TSX DM PR40 E.

2.9.1 Implementation with TSX PLCs S7 model 40

Resource requirements

I/O bases	Max. number	Data	Code	Constants	Performance
170 ADI 350 00 170 ADI 340 00 170 ADM 350 10 170 ADM 390 30 170 ADM 690 50 170 ADO 340 00 170 ADM 370 10 170 ADO 350 00	62 modules max. for executing FAST, MAST and AUX0 48 modules for executing AUX1, AUX2 and AUX3	120 64-bit words	1638 words	16 words	(updating the I/O of a module) 0.65 ms
170 AAO 120 00 170 AMM 090 00 170 AAI 520 40	62 modules max. for executing FAST, MAST and AUX0 48 modules for executing AUX1, AUX2 and AUX3	288 words	2120 words	64 words	0.6 ms
170 AAI 140 00	18 modules max. for executing FAST, MAST and AUX0 12 modules max. for executing AUX1, AUX2 and AUX3	408 words	2360 words	72 words	1.4 ms

2.9.2 Implementation with APRIL 5000 PLCs

Allowable device handling capacity

Equipment devices	CPU5030 / CPU5130
Number of devices - rack-mounted - on FIPIO bus - Total (racks + FIPIO bus)	 69 max. 62 max. 90 max.
Number of discrete channels - rack□mounted - on FIPIO bus - Total (racks + FIPIO bus)	 1248 max. 1248 max. 1664 max.
Number of analog input channels - rack□mounted - on FIPIO bus - Total (racks + FIPIO bus)	 480 max. 200 max. 640 max.
Number of analog output channels - rack□mounted - on FIPIO bus - Total (racks + FIPIO bus)	 240 max. 100 max. 320 max.

Network limitations

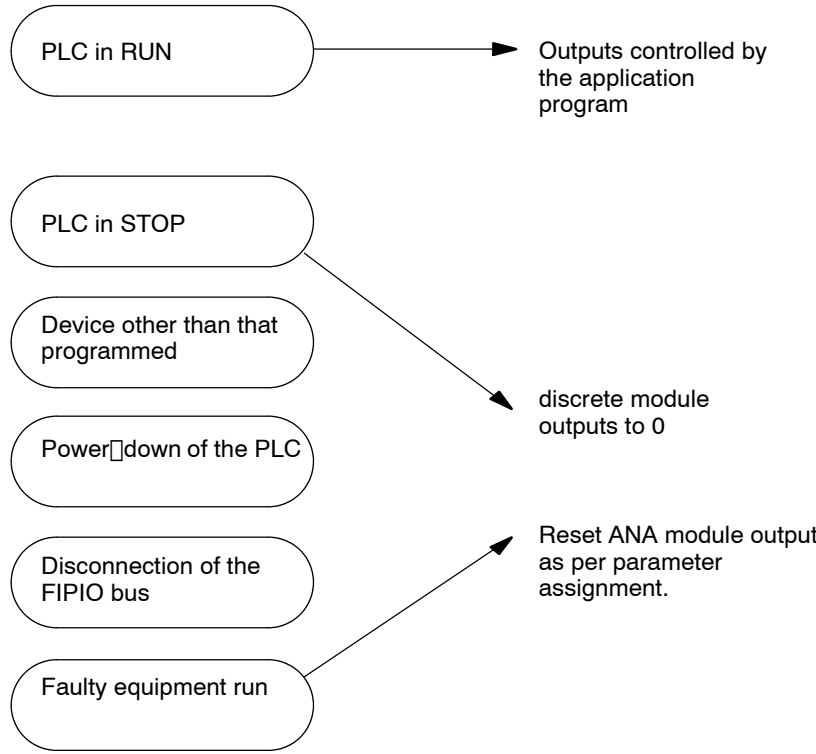
For any given FIPIO bus configuration, the total duration of the primary cycle must not exceed 40 ms.

I/O bases	Primary equipment cycle	Max. number of devices
170 ADI 350 00 170 ADI 340 00 170 ADM 350 10 170 ADM 390 30 170 ADM 690 50 170 ADO 340 00 170 ADM 370 10 170 ADO 350 00	0.7	52
170 AAO 120 00 170 AMM 090 00 170 AAI 520 40	0.7	52
170 AAI 140 00	1.4	26

2.10 Output run modes

The outputs of the MOMENTUM modules follow the run modes of the PLC and are controlled according to the values sent by the PLC at the end of every execution cycle of the application program.

In the case of an fault on the bus, in the PLC or in the equipment device itself, the output signals are reset:


PLC in RUN
Outputs controlled by the application program
PLC in STOP
Device other than that programmed
Power down of the PLC
discrete module outputs to 0
Disconnection of the FIPIO bus
Faulty equipment run
Reset ANA module outputs as per parameter assignment.

Implementation in XTEL

3

3.1 Limitations

Configuring, programming and diagnosing MOMENTUM equipment devices on the FIPIO bus using the XTEL-CONF tool can be accomplished with:

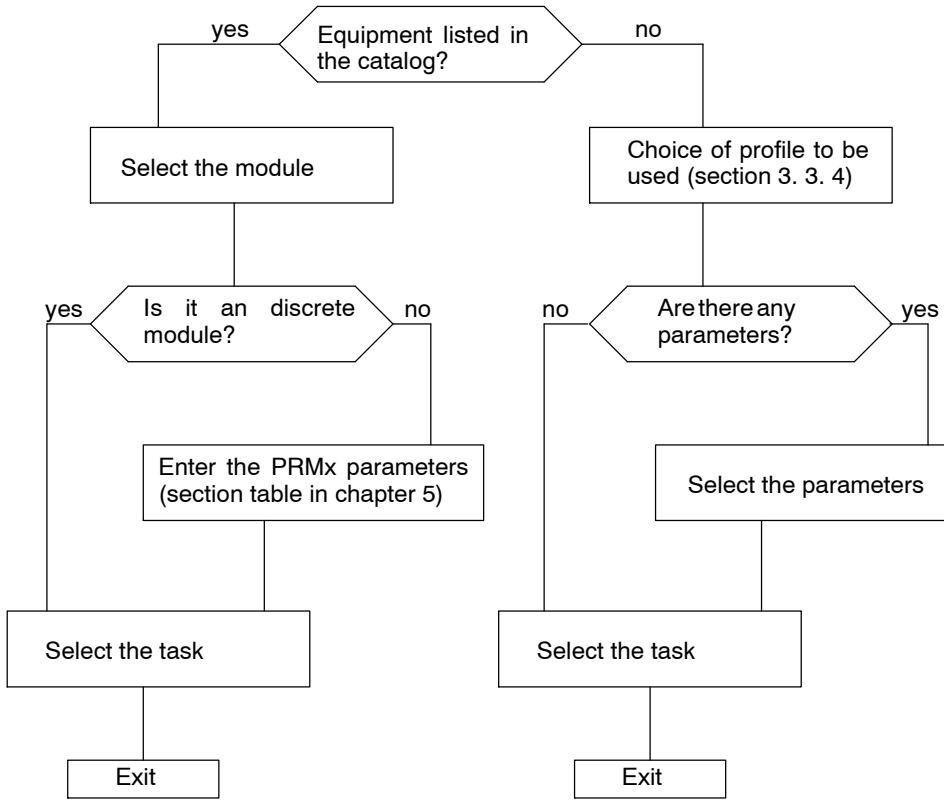
- XTEL V52,
- XTEL V6 (and PL7□3 V6)
  if the diskette TXT LF CTG TSXM V6 has been installed (belongs to the product TXTRCTG V6 E).

Operating MOMENTUM equipment is possible only with versions V5.5 and higher on S7 processors TSX model 40.

TSX MOMENTUM modules are not operable with PMS2.

3.2 Implementation guide

The guide simplifies navigation through this document, depending on whether or not the I/O base used is one listed in the XTEL TXT LF CTG TSXM V6 catalog.



The description of the I/O bits and words and of the adjustments is contained in chapter 5.

The principle of access to the I/O words and adjustments is described in section 3. 4. 1

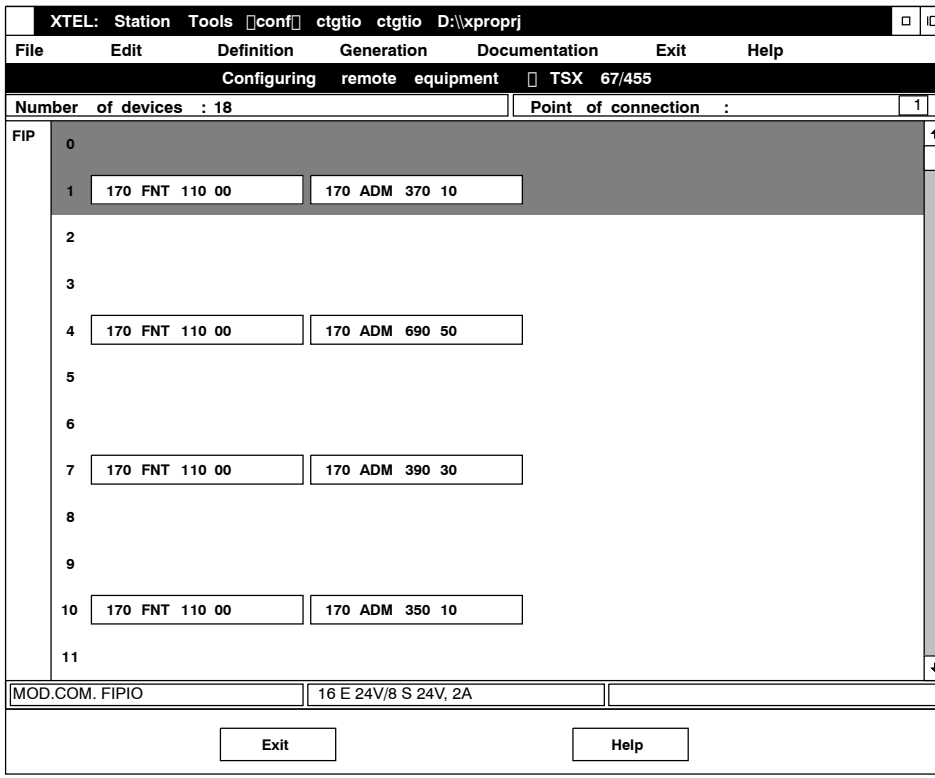
3.3 Equipment configuration

3.3.1 Module selection

In the Station Tools screen, click on the Conf tool to display the Station-Conf. Tool screen.
In the Definition window, select Config. remote I/O to access the remote equipment configuration screen, allowing you to select each point of connection.

Access to remote configurations requires prior specification, in the menu Definition -Config I/O, of a processor with an integrated FIPIO link.

Figure 8 First FIPIO configuration window



20

The screen is subdivided into 64 zones numbered 0 to 63. Each zone represents a point of connection in the FIPIO network and can be occupied by a device, with the exception of zones 0 and 63 which are respectively reserved for the PLC and the programming terminal. The number of the point of connection of a device can be one between 1 and 62.

3.3.2 Point of connection

The number of the point of connection defined as XTEL must be identical to the address assigned by means of the code wheels on the FIPIO communication adapter.
Use the arrow keys or the mouse pointer to select the point of connection. The number of the point of connection is now highlighted. To access the FIPIO configuration, press the ENTER key or double□click on the highlighted line.

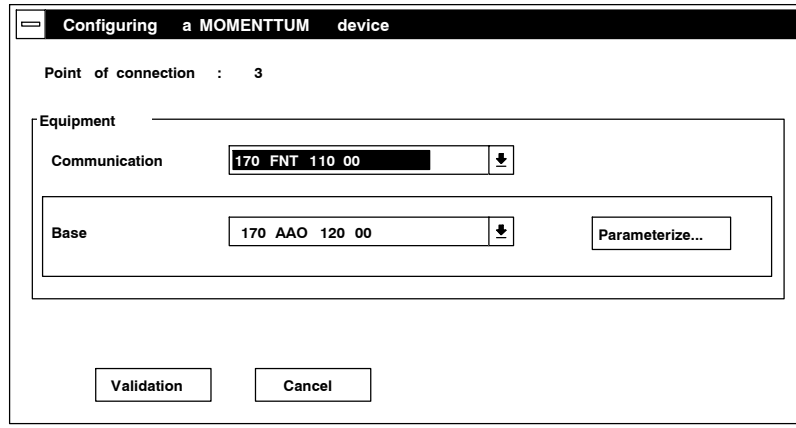
3.3.3 Equipment family

The MOMENTUM equipment family is available only after loading the diskette cat. # TXT LF CTG TSXM V6.

3.3.4 Equipment configuration

Selecting a remote input/output device of the MOMENTUM family gives you access to the following screen:

Figure 9



Equipment

Reference selection zone.

Communication

Select module 170 FNT 110 00

Base

This field lets you select the I/O base connected to the communication adapter.

The product items currently available and listed in the catalog are:

Discrete modules	Analog modules
170 ADI 350 00 170 ADI 340 00 170 ADM 350 10 170 ADM 390 30 170 ADM 690 50 170 ADO 340 00 170 ADM 370 10 170 ADO 350 00	170 AAO 120 00 170 AMM 090 00 170 AAI 520 40 170 AAI 140 00

If the I/O base used is not yet listed in the catalog, select one of the items under Other_FXD[P] along the following criteria:

	I/O base without parameters	**I/O base with parameters**
Number of input words <= 8 and number of output words < = 8	Other_FSD	Other_FSDP
Number of input words > 8 or number of output words > 8	Other_FED	Other_FEDP

To determine the number of input and output words needed for the I/O base employed, refer to the operating manual for the I/O base concerned (ref: 870 USE 002 00) Register syntax .

The number of input words is derived from the following:
Size (in words) of the input values (for an I/O base that shows the input values)
+ the number of status word(s) (for an I/O base that handles status information)

The number of output words is:
the size (in words) of the output values (for an I/O base that handles outputs)

Parameterize

Clicking on this button gives you access to the equipment parameter-assignment screen.

Example

Example

Examples of using items under Other_FXD[P]

170 ADM 350 10

- 16 discrete inputs
  No status word
  hence forward 1 input word
- 16 discrete outputs,
  hence forward 1 output word
- No parameters

The 170 ADM 350 10 can thus be used as a module under Other_FSD

170 AAO 120 00

- No input data nor status signal
  hence 0 input word
- 4 analog output words
  hence 4 output words
- 1 parameter word

The 170 AAO 120 00 can thus be used as a module under Other_FSDP

170 AAI 140 00

- 16 analog input words
  No status
  hence 16 input words
- No output data
  hence 0 output words
- 4 parameter words

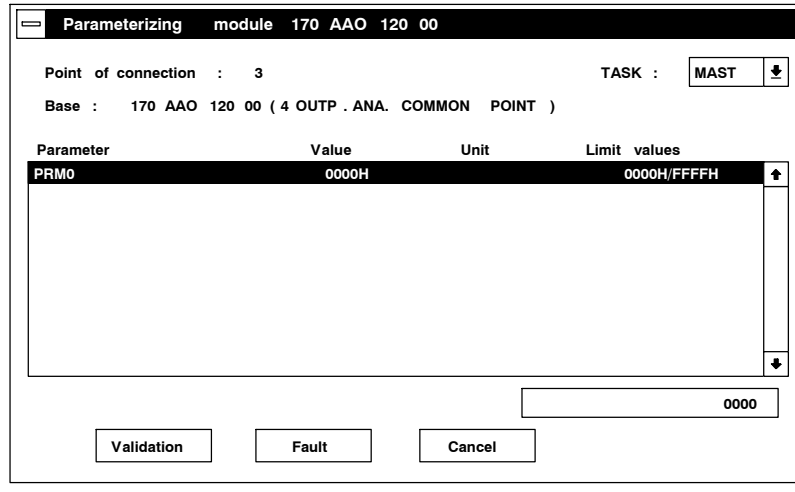
The 170 AAI 140 00 can thus be used as a module under Other_FEDP

3.3.5 Equipment parameterization

The data accessible on this screen are:

- Task selection for controlling the equipment
- Initial parameter value when the I/O base used needs parameters

Figure 10 Parameter screen



Task

Pick List permitting task selection (FAST, MAST, AUX0, AUX1, etc ...) at the location of the equipment (default task is MAST).

Caution

The task controlling the MOMENTUM equipment must not exceed a time interval of 256 ms.

Parameters

■ ■ PRM 0 to PRM 31 (or PRM29) are the control parameters for the I/O base to which the communication adapter is connected.

Refer to the documentation for the I/O base used for information on the necessary number of parameter words, a description of the values as well as the order in which the words are to be entered, (the first parameter word should be entered in PRM0).

Caution

The PRMxx words which are not used by the I/O base must absolutely be left at a value of 0.

Caution

There are no default settings for these parameters. Thus specific parameter values must be supplied by the user for all PRMxx words presented by the software.

Also refer to the table in Chapter 5 which specifies for each MOMENTUM I/O base listed in the XTEL catalog how the parameter words should be entered.

Value

Current parameter value displayed in hexadecimal.

Unit

Not significant.

Limit values

Minimum/maximum value range allowable for the parameter concerned: 1 - FFFEh for equipment of the MOMENTUM family.

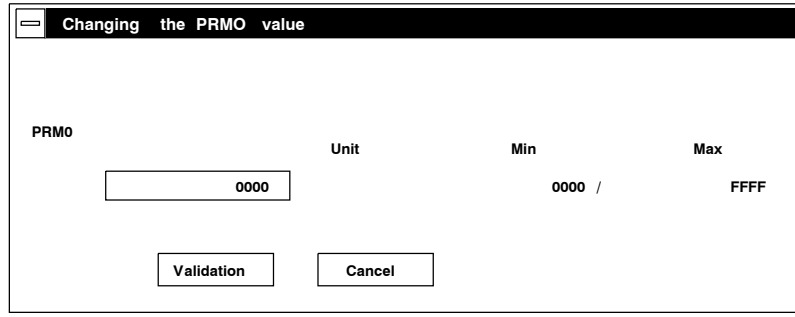
Default

This button assiggns the MAST value to the task that controls the equipment and initializes at 0 the parameters and PRMxx.

Entering a PRMxx parameter
There are two operating modes:

- Select the parameter using the arrow keys or the mouse and access the hexadecimal parameter value in the bottom right section of the window.
- Select the parameter using the arrow keys or the mouse and double-click, or press ENTER, to access the following dialog box:

Figure 11 Selecting the parameter values



The name of the parameter is called up along with the minimum and maximum values; the unit is unimportant. The value to be addressed is a hexadecimal value.

Caution

XTEL does not check the parameter values entered; if an incorrect value is used, it may prevent the equipment from being started up (in the case of an inconsistent value) or from operating as intended (in the case of a consistent value).

Note

The adjustment values assigned to the PRMx words can be modified by a program, (refer to Chapter Programming). These initial values entered via XTEL-CONF in the PRMx words are sent to the equipment each time it is initialized.

3.4 Programming

3.4.1 Objects available for programming

Access by the user to the inputs of the MOMENTUM equipment, allocation of its outputs and modification of its adjustment parameters are accomplished by way of the different registers which are directly operable within the PLC program. Access to these registers requires correlating the configuration (established under XTEL-CONF) with PL7-3 by an appropriate reconfiguration operation. This is initiated in PL7-3 using the V5CONF button for XTEL V52 and the XTEL-CONF Tools/Feedback Function menu for the XTEL V6.

The following tables explain the mnemonics of the objects available for the application.

I/O base of the discrete type
The program accesses the input bits with the following syntax:

Channels 1 to 16:

RIAx,0,y
x = address of the equipment on the FIPIO bus: 1 to 62 in decimal
0 = module number: always 0
y = position of the bit in the channel: 0 to 15

Channels 17 to 32:

RIBx,0,y
x = address of the equipment on the FIPIO bus: 1 to 62 in decimal
0 = module number: always 0
y = position of the bit in the channel: 0 to 15

The syntax is the same for the output bits: ROAx,0,y and ROBx,0,y

Caution

This syntax applies only to the discrete modules listed in the XTEL catalog. It is described in the following paragraph: Other I/O bases.

Object	Description	Access	Format
RIAx,0,y	bits 0 to 15 showing the equipment inputs	read	16 bits
RIBx,0,y	bits 16 to 31 showing the equipment inputs	read	16 bits
ROAx,0,y	bits 0 to 15 showing the equipment outputs	read / write	16 bits
ROBx,0,y	bits 16 to 31 showing the equipment outputs	read / write	16 bits

Comment:

For all I/O bases of the discrete type, the language elements provide 32 input bits and 32 output bits. Only the bits corresponding to physical inputs and outputs are significant bits. The others are to be ignored.

Other I/O bases

■ ■ Size of inputs and outputs smaller than or equal to 8 words:

The program accesses the input/output words with the following syntax:

RIWx,0,y(,t)
x = address of the equipment on the FIPIO bus: 1 to 62 in decimal
0 = module number: always 0 for the equipment
y = RIW number: 0 to 7
t = (bit location in the word: 0 to F in hexadecimal)

The syntax is the same for the output words ROWx,0,y,(t)

Object	Description	Access	Format
RIWx,0,y(,t)	8 words showing the equipment inputs	read	16-bit words
ROWx,0,y(,t)	8 words showing the equipment outputs	read / write	16-bit words

■ ■ Size of inputs or outputs greater than 8 words:

The syntax obeys the same principles as for the preceding I/O bases, except that the first 16 words are accessed by RIWA and ROWA objects, the following 16 by RIWB and ROWB:

Access to the first 16 input words:

RIWAx,0,y(,t)

x = address of the equipment on the FIPIO bus: 1 to 62 in decimal
0 = module number: always 0 for the equipment
y = RIWA number: 0 to 15
t = (bit location in the word: 0 to F in hexadecimal)

Access to the following 16 input words:

RIWBx,0,y(,t)

x = address of the equipment on the FIPIO bus: 1 to 62 in decimal
0 = module number: always 0 for the equipment
y = RIWB number: 0 to 15
t = (bit location in the word: 0 to F in hexadecimal)

Object	Description	Access	Format
RIWAx,0,y(,t)	Words 0 to 15 showing the equipment inputs	read	16-bit words
RIWBx,0,y(,t)	Words 16 to 31 showing the equipment inputs	read	16-bit words
ROWAx,0,y(,t)	Words 0 to 15 showing the equipment outputs	read / write	16-bit words
ROWBx,0,y(,t)	Words 16 to 31 showing the equipment outputs	read / write	16-bit words

Any type of I/O base used:

Object	Description	Access	Format
STATUSAx,0,0	1 word containing diagnostic information relative to the equipment and to the communication between the PLC and the communication adapter	read	1 16-bit word
RDx,0,0	1 word indicating an updating error in the equipment inputs shown. A non-zero value indicates that the values contained in the RI bits or the RIW words are not significant	read	1 16-bit word
ERRORx,0,0	Error bit is set to 1 when the equipment is not operating	read	1 bit

For I/O bases requiring parameter assignment:

Object	Description	Access	Format
PRMAx,0,y PRMBx,0,y	32 adjustment words: Words 0 to 15 Words 16 to 31 The significance and the coding of these words are shown in chapter 5	read / write	16-bit words
READPRMx,0,0	Read-instruction bit for the adjustment parameters: Setting the bit at 1 triggers the reading of the parameters established in the equipment and the updating of PRMA and PRMB words; completion of the exchange is signaled by the return of the bit to 0	read / write	1 bit
SENDPRMx,0,0	Write-instruction bit for the adjustment parameters: Setting the bit at 1 triggers the transfer of the contents of the PRMA and PRMB words to the equipment; completion of the exchange is signaled by the return of the bit to 0	write	1 bit

These bits and words can also be visually accessed using the PL7-3 Data mode or with the ADJUST / SYSDIAG adjustment tools.

The content of these different registers is explained in detail in the following sections. For the STATUSA and RD registers, the content is shown in the sections 3.5.2 and 3.5.3 discussing the diagnostics.

3.4.2 Equipment input pattern

The PLC provides the cyclic refresh rate for all inputs (RIA, RIB, RIW, RIWA, RIWB) at the start of the programming task involving the equipment.

The distribution of the data in the input words depends on the I/O base used, along the following principles:

- If the I/O base used shows status information, that will follow the input values.
- If the total amount of input information (status + input values) is less than 8 or 32 words, the remaining words are automatically forced to 0.

Chapter 5 contains a table which specifies for each MOMENTUM I/O base listed in the XTEL catalog the order and significance of the input and output data.

Each word or bit in a word can be represented by its physical address or by a symbolic name, which must be predefined using the SDBASE XTEL station tool.

☞ **Note**
The input pattern words and bits contain significant values only if the diagnostic RD word equals 0. In all other cases the words should not be interpreted by the PLC program. Refer to the paragraph Diagnostics for the list of possible values of the RD word.

3.4.3 Equipment output patterns

The PLC provides a cyclic refresh rate for all outputs (ROA, ROB, ROW, ROWA, ROWB) upon execution of the program task involving the equipment.

The data distribution in the output words depends on the I/O base used

If the total amount of output information is less than 8 or 32 words, the remaining words are not significant and are not transmitted to the I/O base module by the communication adapter.

Chapter 5 contains a table which specifies for each MOMENTUM I/O base listed in the XTEL catalog the order and significance of the input and output data.

Each word or bit in a word can be represented by its physical address or by a symbolic name, which must be predefined using the SDBASE XTEL station tool.

3.4.4 Modifying the equipment settings

The equipment adjustment parameters are read- and write-accessible via the PLC program in these PRMAx,0,y and PRMBx,0,y words:

PRMAx,0,y
x = address of the equipment on the FIPIO bus: 1 to 62 in decimal
0 = module number: always 0
y = adjustment parameter number: 0 to F

Chapter 5 contains a table which specifies for each MOMENTUM I/O base listed in the XTEL catalog how the adjustment words are to be used.

Setting the READPRM bit at 1 allows the equipment adjustment parameters to be read; upon completion of the exchange the bit returns to 0: The data present in the PRMAx,0,y and PRMBx,0,y words will now contain the equipment adjustment values thus read.

Setting the SENDPRM bit at 1 allows the values contained in the PRMAx,0,y and PRMBx,0,y words to be transmitted to the equipment; upon completion of the exchange the bit returns to 0.

If the adjustment values transmitted have been rejected by the equipment, the Application Default bit of the STATUS A register is set. The equipment continues to operate with the last valid adjustment values received.

3.5 PLC diagnostics in XTEL

3.5.1 System bits and words

The diagnostic information contained in the table below is not equipment-specific but applies in general at the PLC level.

System bits and words	Description	Function
SY10	General I/O or FIPIO equipment default	While normally at 1, this bit is at 0 in the event of a fault in an I/O module or a device connected to the FIPIO.
SY16	I/O or FIPIO equipment fault in executing the task	While normally at 1, this bit will be at 0 in the event of a fault in an I/O module or a device connected to the FIPIO as configured for the task. This bit must be reset to 1 by the user program. An SY16 bit is allocated to each of the configured tasks (IT, FAST, MAST, AUX0 to AUX3). It is thus significant only for the task in which it is used.
SY118	Remote I/O or FIPIO equipment fault	While normally at 1, this bit is set to 0 in the event of a fault of a device connected to FIPIO or a fault in the link.
SW116	Remote I/O or FIPIO equipment fault	This word indicates a communication failure on FIPIO, between the processor and a device, in the execution of the task. Each bit (0 to 7) signifies a fault bit 0: all values invalid, bit 1: presence of invalid values, bit 2: total absence of any update, bit 3: partial absence of updates, bit 4: complete dialog failure, bit 5: partial dialog failure, bit 6: global refresh failure, bit 7: partial refresh failure.
SW118 to SW121	Remote I/O or FIPIO equipment fault	Every bit in these 4 system words is indicative of the state of a point of connection. The presence of a bit at 0 indicates the occurrence of an exchange or procedural error of a device; for instance SW118,0 for point of connection 0, etc.
Errorx,0,0	Remote I/O or FIPIO equipment fault	Error bit is set when device with FIPIO address x does not work.

3.5.2 Diagnostic module register: STATUSA

This 16 bit word contains diagnostic information for the MOMENTUM equipment connected as well as diagnostic information on the data exchanges with the equipment across the FIPIO bus.

STATUSAx,0,0
x = Standard FIPIO status register
0 = address of the point of connection on the FIPIO bus (1 to 62)
0 = always 0

This register gets updated even while the PLC is in STOP mode. When the STATUSA bit switches to 1, the I/O LED of the PLC processor will light up.

The least significant byte contains diagnostic information generated by the MOMENTUM equipment.

The most significant byte contains diagnostic information processed by the PLC.

Table 1 Definition of the STATUSA register

Bit	Description
	Status generated by the MOMENTUM equipment (8 least significant bits)
0	Serious but temporary internal fault in the I/O base
1	Minor external fault on the I/O base
2	Not used
3	Not used
4	Internal module fault (failure)
5	Hardware configuration problem
6	Error in communicating with the PLC
7	Application error (adjustment values rejected)
	Status generated by the PLC (8 most significant bits)
8	Configuration problem
9	Module missing
A	Module not operating
B	Faulty module
C	Internal fault, TSX hardware fault
D	Internal fault, TSX system fault
E	Dialog problem, FIPIO communication failure
F	Dialog problem, incorrect equipment parameters

Serious but tempotary internal fault in the I/O base (bit 0)
When this bit appears, a transient disturbance affects the performance of the I/O base connected to the communication adapter (for instance electromagnetic interference). As soon as that problem disappears, the equipment resumes normal operation.

Minor external problem on the I/O base (bit 1)
When this bit appears, an external problem exists on the I/O base used; the nature of the problem depends on the I/O base itself. You should therefore refer to the documentation for the I/O base used to determine which type of fault condition can be flagged in the application program by the I/O error signal for the type of I/O base concerned (e.g. short□circuits etc.).

3.5.3 Equipment input validity register: RD

This 16 bit word indicates an error that occurred when the input patterns of the MOMENTUM equipment were being updated.
If RD equals 0, the input values of the equipment are valid and can be used by the PLC program.

The most significant RD byte is generated by the MOMENTUM equipment during input acquisition.

The possible values of this byte are as follows:

- 0: The input values are suitable for use by the program (if the least significant byte also equals 0)
- FFh: The equipment is inoperative; the input values are not usable for the program
- 01: A minor external problem exists on the I/O base; the input values cannot be used by the program
- 02: A serious temporary fault exists in the I/O base; the input values cannot be used by the program

The least significant RD byte is generated by the PLC processor. It relates to the cyclic updating of the inputs across the FIPIO bus. If it is other than zero, the variable input patterns may contain old and incorrect values and must be ignored by the application.

The RD register and the input pattern words are not updated when the PLC is in STOP mode: They will retain their last value.

3.5.4 Error information contained in the input words

Depending on the type of I/O base used, certain fault-related information can be reflected in the input data of the equipment.
You should refer to your I/O base documentation to determine whether the I/O base used displays status information or whether certain faults are indicated by the values outside the input range.

3.5.5 Set□up and adjustment tools

The SYSDIAG and ADJUST tools of the software house XTEL can be used for the diagnostics and the adjustment of the MOMENTUM equipment. They are employed in the same way as for any other FIPIO equipment. Refer to the XTEL documentation for further details on this subject.

Implementation in ORPHEE

4

4.1 Limitations

The ORPHEE configuration editor permits the connection and configuration of equipment devices on the FIPIO bus. The configuration of a MOMENTUM device requires an ORPHEE version >= 6.2.
The following paragraphs describe the operating mode that permits the use of a MOMENTUM device on the FIPIO bus controlled by APRIL 5000.
For further details on the principles of connecting and configuring equipment on the FIPIO bus, refer to the documentation titled ORPHEE/ORPHEE-DIAG adjunct for using the FIPIO bus with APRIL 5000 ref. TEM10000/10800E.
Operating MOMENTUM equipment is possible with version 2 or higher of the S1000 CPU5030 and S1000 CPU5130 processors.

4.2 Equipment selection

The MOMENTUM device must be programmed within the STD_P configuration screen family of the FIPIO bus. Access to the configuration screen of the FIPIO bus requires prior declaration of a CPU5030 or CPU5130 (processors integrating the FIPIO link).
To connect a MOMENTUM device to FIPIO, click on the STD_P button, enter the number of the point of connection (1 to 62) and select the reference that corresponds to the I/O base used:

	I/O base without parameters	**I/O base with parameters**
Number of input words <= 8 and number of output words < = 8	FSDM8	FSDM8P
Number of input words > 8 or number of output words > 8	FEDM32	FEDM32P

To determine the number of input and output words needed for the I/O base used refer to chapter 5 of this document or to the user manual of the I/O bases (870 USE 002 00)

The term input words refers to the sum of the following:

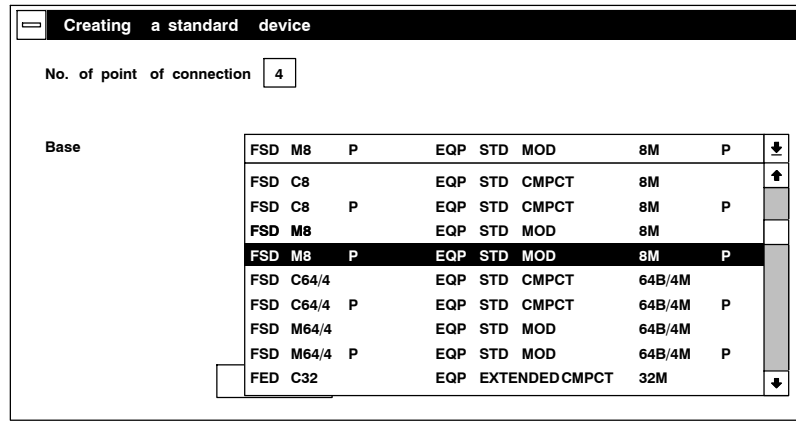
- Size (in words) of the input values (for an I/O base that shows the input values)
- \+ the number of status words (for an I/O base that handles status information)

The term output words refers to:
Size (in words) of the output values (for an I/O base that manages output data)

Chapter 5 contains a table which specifies for each MOMENTUM I/I base product item the STD_P reference to be selected.

The number of the point of connection defined in ORPHEE must be identical to the address set on the code wheels of the FIPIO communication adapter.

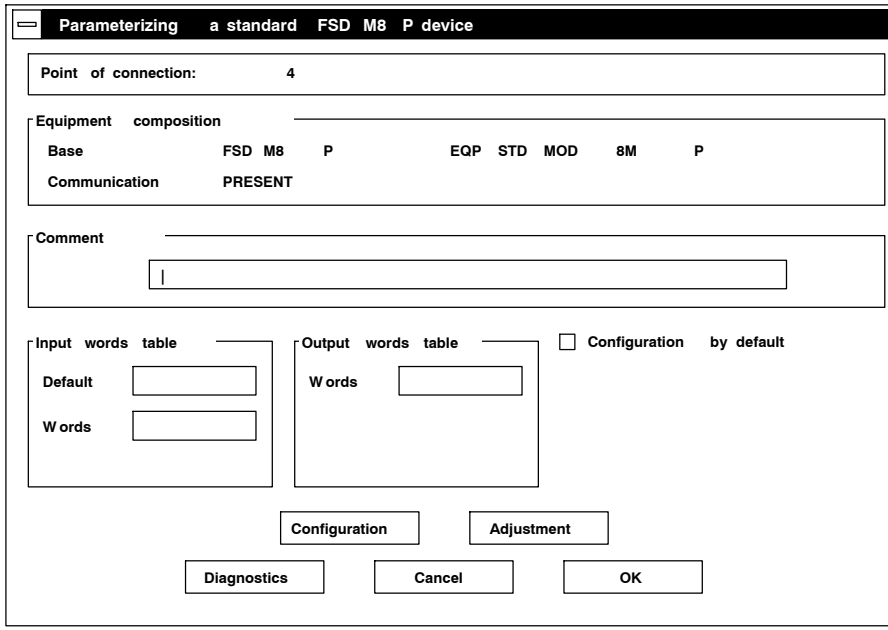
Figure 12 Selecting the equipment


Creating a standard device
No. of point of connection
4
Base
FSD M8 P EQP STD MOD 8M P
FSD C8 EQP STD CMPCT 8M
FSD C8 P EQP STD CMPCT 8M P
FSD M8 EQP STD MOD 8M
FSD M8 P EQP STD MOD 8M P
FSD C64/4 EQP STD CMPCT 64B/4M
FSD C64/4 P EQP STD CMPCT 64B/4M P
FSD M64/4 EQP STD MOD 64B/4M
FSD M64/4 P EQP STD MOD 64B/4M P
FED C32 EQP EXTENDED CMPCT 32M

4.3 Parameter assignment

The MOMENTUM equipment appears in the list of connected devices under reference FSDM8[P] or FEDM32[P]. Select it with the arrow keys and press ENTER or double□click with the mouse, or select Parameters in the Parameter/Access menu to bring up the main parameter screen:

Figure 13 Parameter screen



Point of connection	Unmodifiable information field for calling up the FIPIO address of the equipment (between 1 and 62).
Equipment composition	Unmodifiable information field for calling up the selected reference.
Comment	Comment entry line, appearing in Dynamic Display and constituting a part of the application folder. This is where you can specify the name of the equipment represented by reference FSDM8[P] or FEDM32[P].
Input tabulation Default	Word validating the input values updated by the equipment in the table of 8 or 32 words below. The variable to be entered is of the %MW type. The possible values are indicated in the chapter titled Diagnostics .
Input tabulation Words	Table of 8 or 32 words of the %MW type containing input and status values, cyclically refreshed. The description of the information updated in the different %MW is given in the paragraph titled Programming .
Output tabulation Words	Table of 8 or 32 words of the %MW type containing output values, cyclically refreshed. The description of the information provided in the different %MW s is given in the paragraph titled Programming .

Caution

The validating word is to be provided by the program.

	References FSDM8 and FEDM32
Configuration by default	This button is marked and shaded (and therefore inaccessible) to indicate that the equipment does not have any configuration or adjustment parameters.
	References FSDM8P and FEDM32P
Configuration by default	This button is not to be marked.
Configuration	No configuration value is to be entered by any equipment of the MOMENTUM line. This button is therefore not to be used.
Adjustments	This button permits access to the input screen for the initial values of the adjustment parameters for I/O bases that need parameter assignment. The parameter values on the screen that are accessed by the Adjustment button are transmitted to the equipment upon every STOP -> RUN transition or upon every power-up or connection of the PLC or equipment to the FIPIO bus.

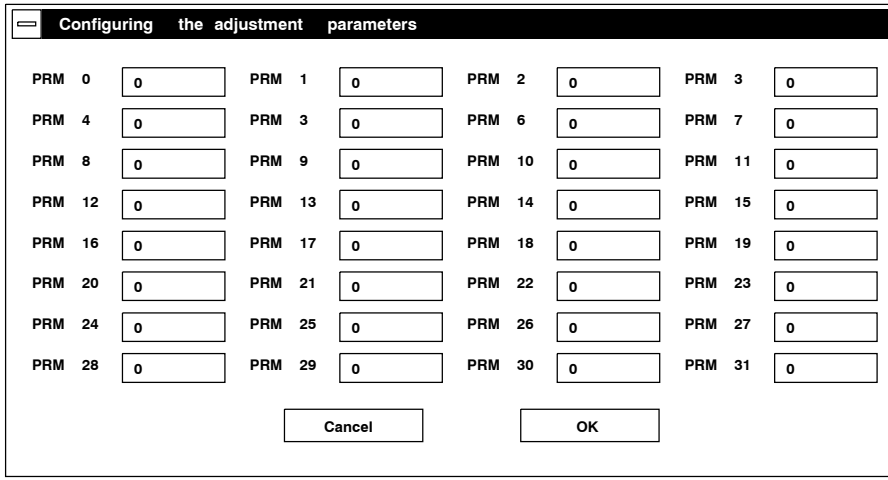
Caution

Do not use the Configuration by default function. The initial value of the adjustment parameters necessary for the operation of the I/O base used must be entered in any event.

Entering a PRMxx parameter

The input screen for the values of the initial adjustment parameters of the equipment is as follows:

Figure 14



- in hexadecimal. Example: 16#01AB
- in decimal, with values between -32768 and +65535

Refer to chapter 5 to determine the necessary number of parameter words as well as for a description of the possible values and the order to be observed for entering the words (the first parameter word must be entered in PRM0).

Caution

The PRMxx words which are not used must absolutely be left at a value of 0. If not, the module won t be parameterized (fault DL2).

Caution

ORPHEE does not check the parameter valuese entered; if an incorrect value is used, it may prevent the equipment from being started up (in the case of an inconsistent value) or from operating as intended (in the case of a consistent value).

Note

The adjustment values contained in the PRMx words can be modified with the aid of BFC WRIT_PRM (cf. paragraph Programming). These initial values entered via XTEL-CONF in the PRMx words are sent to the equipment each time it is initialized.

4.4 Programming

4.4.1 Available objects for programming

The user accesses the inputs of the MOMENTUM equipment and sets its outputs by way of the variables defined in the configuration screens of the equipment.

Reading and modifying the adjustment parameters is accomplished with the aid of BFC READ_PRM and WRIT_PRM, respectively. The following table explains the nature of the objects available for this application.

I/O base corresponding to reference FSDM8

Object	Description	Access	Format
Input words table	8 words showing the equipment inputs.	read	table of 8 %MW
Output words table	8 words showing the equipment outputs.	read / write	table of 8 %MW
Input tabulation: Default word	1 word indicates an updating error in the input pattern of the equipment. A value other than zero indicates that the values contained in the input words are not significant.	read	1 %MW word

I/O base corresponding to reference FSDM8P

Object	Description	Access	Format
Input words table	8 words showing the equipment inputs.	read	table of 8 %MW
Output words table	8 words showing the equipment outputs.	read / write	table of 8 %MW
Default word	1 word indicating an updating error in the equipment input pattern. A value other than zero indicates that the values contained in the input words are not significant.	read	1 %MW word
PRM0 to PRM31	32 adjustment words.	read / write	table of 32 %MW
BFC READ_PRM	Activating this BFC triggers the reading of the parameters in effect in the equipment and the updating of the table of 32 %MW of the BFC BUFF input; completion of the exchange is signaled by the return of the BFC ACT output to 0.		BFC
BFC WRIT_PRM	Activating this BFC triggers the transfer of the contents of the table of 32 %MW from the BFC BUFF input to the equipment; completion of the exchange is signaled by the return of the BFC ACT output to 0.		BFC

I/O base corresponding to reference FEDM32

Object	Description	Access	Format
Input words table	32 words showing the equipment input pattern.	read	table of 32 %MW
Output words table	32 words showing the equipment output pattern.	read / write	table of 32 %MW
Default word	1 word indicating an updating error in the equipment input pattern. A value other than zero indicates that the values contained in the input words are not significant.	read	1 %MW word

I/O base corresponding to reference FEDM32P

Object	Description	Access	Format
Input words table	32 words showing the equipment input pattern.	read	table of 32 %MW
Output words table	32 words showing the equipment output pattern.	read / write	table of 32 %MW
Default word	1 word indicating an updating error in the equipment input pattern. A value other than zero indicates that the values contained in the input words are not significant.	read	1 %MW word
PRM0 to PRM29	30 adjustment words.	read / write	table of 32 %MW
BFC READ_PRM	Activating this BFC triggers the reading of the parameters in effect in the equipment and the updating of the table of 30 %MW of the BFC BUFF input; completion of the exchange is signaled by the return of the BFC ACT output to 0.		BFC
BFC WRIT_PRM	Activating this BFC triggers the transfer of the contents of the table of 30 %MW of the BFC BUFF input to the equipment; completion of the exchange is signaled by the return of the BFC ACT output to 0.		BFC

Also, as in the case of every board in the rack or any equipment on the FIPIO bus, any fault related to a MOMENTUM device can trigger a diagnostic %TD operation. For further details, refer to the chapter titled Diagnostics .

A detailed description of the information contained in these variables is given in the following sub-paragraphs, with the exception of the default word for the input table the content of which is described in the following paragraph relating to diagnostics.

4.4.2 Equipment input pattern

Access to the inputs of the MOMENTUM equipment is obtained using the table of 8/32 %MW words defined in the configuration editor.
The PLC refreshes the table in cyclic fashion at the beginning of an automatic control cycle prior to executing the application program.

The data distribution within the input words depends on the I/O base used, along the following principles:

- If the I/O base shows status information, that will appear following the input values (up to now not realized).
- If the total amount of input information (status + input values) is less than 8 or 32 words, the remaining words will be automatically forced to 0.

Symbolic names must be assigned to the input table. Each bit in the word can be represented by a symbol if predefined by the declaration editor.

Caution

The content of these words is only to be considered significant if the default word of the input tabulations has a value of 0. In all other cases the tabulation words must not be used by the PLC program. Refer to the Diagnostics paragraph for a list of possible values of the input tabulation default word.

Chapter 5 contains a table which specifies for each MOMENTUM I/O base the order and the significance of the input and output data.

4.4.3 Equipment output pattern

Access to the outputs of the MOMENTUM equipment is obtained using the table of 8/32 %MW words defined in the configuration editor.
The PLC refreshes the entire table in cyclic fashion at the end of an automatic control cycle after execution of the application program.

The data distribution within the output words depends on the I/O base used. If the total amount of output information is less than 8 or 32 words, the remaining words are not significant and are not transmitted to the base module by the communication adapter.

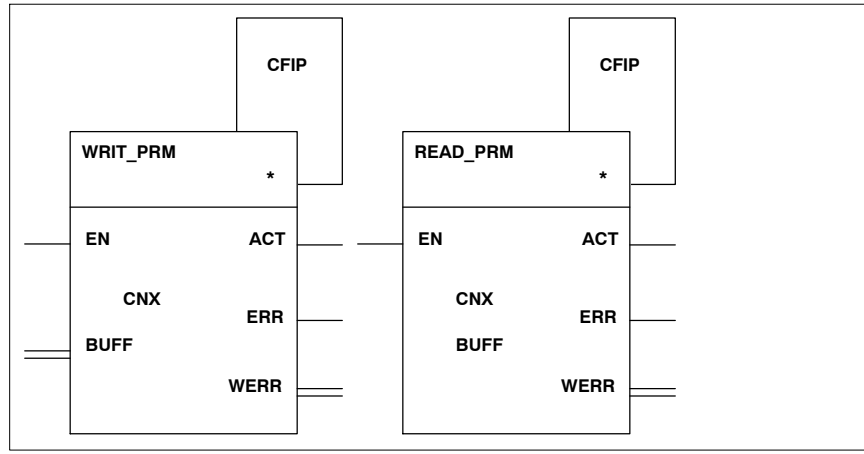
Symbolic names must be assigned to the input table. Each bit in the word can be represented by a symbol if predefined by the declaration editor.

Chapter 5 contains a table which specifies for each MOMENTUM I/O base the order and the significance of the input and output data.

4.4.4 Modifying the equipment parameters

The equipment parameters are accessible in the read and write mode with the aid of BFC READ_PRM and WRIT_PRM:

Figure 15



Refer to the ORPHEE documentation (adjunct for use of the FIPIO bus with APRIL 5000) for the operating principles of these BFCs.

When the ACT output of a BFC READ_PRM drops back to 0, it ensures that the values of the parameters retrieved in the equipment are available in the BUFF table (unless ERR=1, in which case the reason for the error is indicated in WERR).

When the ACT output of a BFC WRIT_PRM drops back to 0, while ERR=0, it ensures that the transmission of the variable which conveys the parameter values over the FIPIO bus was requested by the CPU; it does not guarantee, however, that the equipment has received or responded to the variable. It is therefore strongly recommended that a BFC READ_PRM is subsequently activated to verify establishment of the parameters.

If the parameters transmitted are rejected by the equipment, the latter will continue to operate with the last valid parameter values received by it.

4.5 Diagnostics

4.5.1 System diagnostics

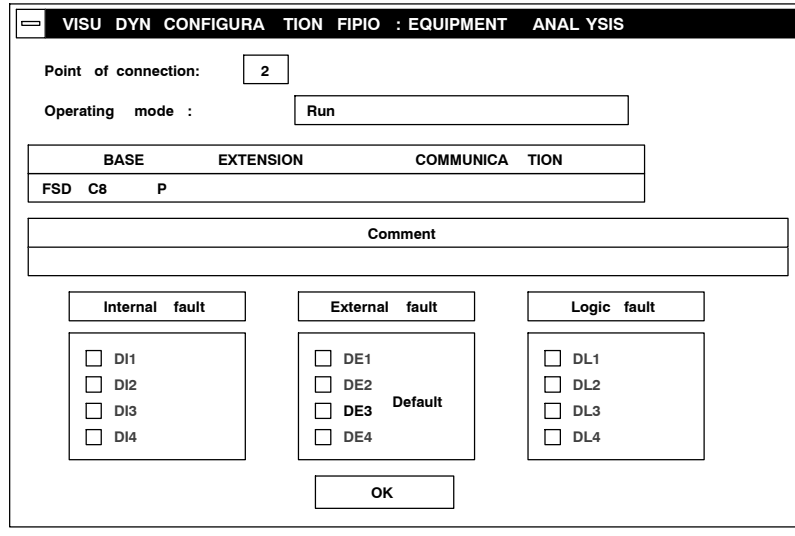
The system diagnostic functions of the MOMENTUM equipment connected to the FIPIO bus are accessible on a dynamic display. It is possible:

- to read the hardware configuration and to compare it with the configuration programmed into the PLC,
- and to dynamically visualize the configuration in the configuration editor.

Refer to the adjunct for operating the FIPIO link with APRIL 5000 in the ORPHEE documentation (ref. TEM10000/10800F) for a review of the different operating modes.

For the MOMENTUM equipment, details of the device and possible faults can be looked up in the Diagnostic chart function of the Diagnostics menu through dynamic visualization of the configuration editor.

Figure 16 Equipment Analysis Screen



Faults are grouped into three categories : internal, external, and logic.

Internal faults:
Internal faults are not used for MOMENTUM equipment.

Logic faults:
- DL1 = Not used
- DL2 = The equipment is not parameterized or its parameters are not valid
- DL3 = Not used
- DL4 = Communication fault

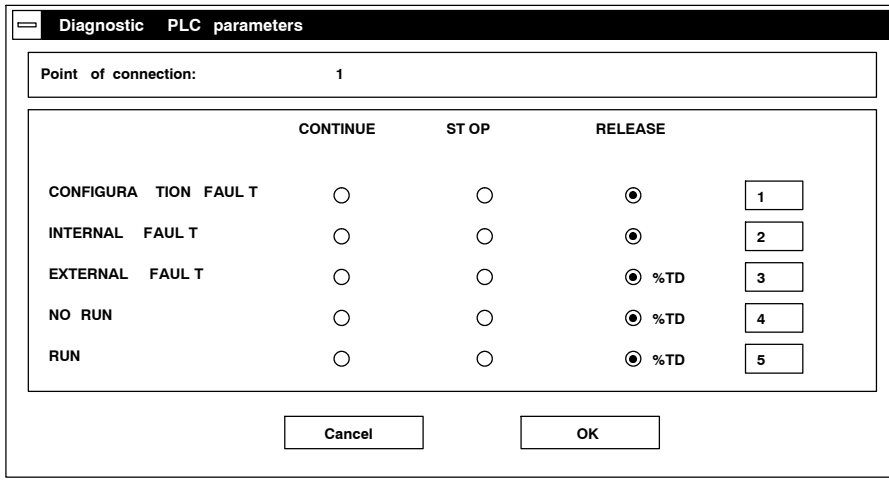
External faults:
- DE1 = Not used
- DE2 = Not used
- DE3 = Minor external I/O base fault
- DE4 = Serious but temporary internal I/O base fault

Minor external I/O base fault (DE3)
When this bit appears, there is an external fault at the I/O base used; the nature of the fault depends on the I/O base itself. It is therefore advisable to refer to the documentation on the I/O base used to determine what type of external fault can be flagged by the application program for this particular I/O base by means of an I/O Error message (short□circuit, etc...).

Serious but temporary internal fault in the I/O base (DE4)
When this bit appears, a transient disturbance is affecting the performance of the I/O base connected to the communication adapter (for instance electromagnetic interference). As soon as that interference disappears, the equipment will resume normal operation.

It is possible to signal to the client program the occurrence of faults in the equipment by executing %TD if that was declared before at the time the equipment information was entered in the configuration editor.

Figure 17 Diagnostic PLC parameters



Triggering of an internal fault %TD:
Not used

Triggering of a configuration fault %TD:
A configuration fault is signalled in the following situations:

- Power supply failure in the I/O base module
- The equipment cannot be connected to FIPIO
- The device is missing
- The equipment is not in operating condition and is off the network

Triggering of NO RUN %TD:
Incorrect mode of operation of the equipment

Triggering of an external fault %TD:
An external fault is signaled in the following situations:

- External type fault at the I/O base
- Transient internal fault in the I/O base

Triggering a RUN %TD:
Any disappearance of a fault that occurred in the MOMENTUM equipment triggers the execution of a RUN %TD.

As soon as a fault is indicated on the FIPIO bus, the indicators 9 and EXT FAULT of the CPU5030 or CPU5130 will light up.

4.5.2 Validating word for the equipment inputs

This 16-bit word called Fault, appearing on the parameter screen of an FSDM8[P] or FEDM32[P] reference device, indicates an error that occurred during the updating of the pattern variables of the equipment inputs.

If that word equals 0, the input values of the equipment are valid and can be used by the PLC program.

The high-order byte of this word is not significant.

The least significant byte of this word is processed by the FIPIO communication adapter at the time of the input acquisition.

The possible values of this byte are as follows:

- 0: The input values can be used by the program
- FFh: The MOMENTUM equipment is not working; the input values cannot be used by the program
- 01: A minor external fault exists at the I/O base; the input values cannot be used by the program (this corresponds to DE3)
- 02: A serious temporary fault exists at the I/O base; the input values cannot be used by the program (this corresponds to DE4)

When the MOMENTUM equipment is disconnected from the FIPIO bus or powered down, the validating word takes on a value of FF (hexadecimal) and in this case the words (input pattern) are no longer valid: They are held at their last valid value.

The default word, the words (input pattern) and the diagnostic information are updated even when the PLC is in STOP mode.

4.5.3 Fault information occurring in input words

Depending on the type of I/O base used (for instance certain analog modules), certain fault information can be contained in the input pattern words relating to the equipment (out of range, broken wire).
It will be advisable to refer to the I/O base documentation to determine whether the I/O base used shows status information or whether certain faults are indicated by values outside the range of the input values.

This information does not apply to the release of % TD nor to the indication of faults handled by the PLC (DE, DL).

4.5.4 Use of ORPHEE or ORPHEE DIAG for diagnostics

The dynamic display function of the ORPHEE configuration permits access to the detailed diagnostic program of the MOMENTUM equipment and of any other equipment connected to the FIPIO bus.

Summary tables and parameter assignment

5

5.1 Programming MOMENTUM I/O bases with XTEL and ORPHEE

5.1.1 Programming in XTEL

X always refers to the number of the point of connection of the equipment device

Table 2 Implementation in XTEL (discrete modules)

I/O bases	Parameter assignment	Input values	Output values	Adjustment
170 ADI 350 00	None	Channels 1 to 16: RIAx,0,y (0<=y<=15) Channels 17 to 32: RIBx,0,y (0<=y<=15)	None	None
170 ADI 340 00	None	Channels 1 to 16: RIAx,0,y (0<=y<=15)	None	None
170 ADM 350 10 170 ADM 350 11	None	Channels 1 to 16: RIAx,0,y (0<=y<=15)	Channels 1 to 16: ROAx,0,y (0<=y<=15)	None
170 ADM 390 30	None	Channels 1 to 10: RIAx,0,y (0<=y<=9)	Channels 1 to 8: ROAx,0,y (0<=y<=7)	None
170 ADM 690 50	None	Channels 1 to 10: RIAx,0,y (0<=y<=9)	Channels 1 to 8: ROAx,0,y (0<=y<=7)	None
170 ADM 370 10	None	Channels 1 to 16: RIAx,0,y (0<=y<=15)	Channels 1 to 8: ROAx,0,y (0<=y<=7)	None
170 ADO 340 00	None	None	Channels 1 to 16: ROAx,0,y (0<=y<=15)	None
170 ADO 350 00	None	None	Channels 1 to 16: ROAx,0,y (0<=y<=15) Channels 17 to 32: ROBx,0,y (0<=y<=15)	None

Table 3 Implementation in XTEL (analog modules)

I/O bases	Parameter assignment	Input values	Output values	Adjustment
170 AAI 140 00	Parameters of channels 1 to 4: PRM0 Parameters of channels 5 to 8: PRM1 Parameters of channels 9 to 12: PRM2 Parameters of channels 13 to 16: PRM3	Channels 1 to 16: RIWAx,0,y (0<=y<=15)	None	Parameters of channels 1 to 4: PRMAx,0,0 Parameters of channels 5 to 8: PRMAx,0,1 Parameters of channels 9 to 12: PRMAx,0,2 Parameters of channels 13 to 16: PRMAx,0,3
170 AAI 520 40	Parameters of channel (i + 1) (0<=i<=3) PRMi	Channels 1 to 4: RIWx,0,y (0<=y<=3)	None	Parameters of channel (i + 1) (0<=i<=3) PRMAi, 0, 0
170 AAO 120 00	Parameters of channels 1 to 4: PRM0	None	Channels 1 to 4: ROWx,0,y (0<=y<=3)	Parameters of channels 1 to 4: PRMAx,0,0
170 AMM 090 00	Parameters of input channels 1 to 4: PRM0 Parameters of output channels 1 and 2: PRM1	Channels 1 to 4: RIWx,0,y (0<=y<=3) Binary inputs: RIWx,0,4 bits 0 to 3	Channels 1 and 2: ROWx,0,y (0<=y<=1) Binary outputs: ROWx,0,2 bits 0 and 1	Parameters of input channels 1 to 4: PRMAx,0,0 Parameters of output channels 1 and 2: PRMAx, 0, 1

5.1.2 Programming in ORPHEE

- INPUTS is the title of the table of words defined for the input values in the configuration display of the device
- OUTPUTS is the title of the table of words defined for the output values in the configuration display of the device

Table 4 Implementation in ORPHEE (discrete modules)

I/O bases	Reference used	Parameter assignment	Input values	Output values
170 ADI 350 00	FSDM8	None	Channels 1 to 16: INPUTS[0] Channels 17 to 32: INPUTS[1]	None
170 ADI 340 00	FSDM8	None	Channels 1 to 16: INPUTS[0]	None
170 ADM 350 10 170 ADM 350 11	FSDM8	None	Channels 1 to 16: INPUTS[0]	Channels 1 to 16: OUTPUTS[0]
170 ADM 390 30	FSDM8	None	Channels 1 to 10: INPUTS[0] bits 0 to 9	Channels 1 to 8: OUTPUTS[0] bits 0 to 7
170 ADM 690 50	FSDM8	None	Channels 1 to 10: INPUTS[0] bits 0 to 9	Channels 1 to 8: OUTPUTS[0] bits 0 to 7
170 ADM 370 10	FSDM8	None	Channels 1 to 16: INPUTS[0] bits 0 to 15	Channels 1 to 8: OUTPUTS[0] bits 0 to 7
170 ADO 340 00	FSDM8	None	None	Channels 1 to 16: OUTPUTS[0] bits 0 to 15
170 ADO 350 00	FSDM8	None	None	Channels 1 to 16: OUTPUTS[0] bits 0 to 15 Channels 17 to 32: OUTPUTS[1] bits 0 to 15

Table 5 Implementation in ORPHEE (analog modules)

I/O bases	Reference used	Parameter assignment	Input values	Output values
170 AAI 140 00	FEDM32P	Parameters of channels 1 to 4: PRM0 Parameters of channels 5 to 8: PRM1 Parameters of channels 9 to 12: PRM2 Parameters of channels 13 to 16: PRM3 PRM4 to 29 to 0	Channels 1 to 16: INPUTS[y] 0<=y<=15	None
170 AAI 520 40	FSDM8P	Parameters of channel 1: PRM0 channel 2: PRM1 channel 3: PRM2 channel 4: PRM3 PRM4 to 31 to 0	Channels 1 to 4: INPUTS[y] 0<=y<=3	None
170 AAO 120 00	FSDM8P	Parameters of channels 1 to 4: PRM0 PRM1 to 31 to 0	None	Channels 1 to 4: OUTPUTS[y] 0<=y<=3
170 AMM 090 00	FSDM8P	Parameters of input channels 1 to 4: PRM0 Parameters of output channels 1 and 2: PRM1 PRM2 à 31 à 0	Channels 1 to 4: INPUTS[y] (0<=y<=3) Binary inputs: INPUTS[4] bits 0 to 3	Channels 1 and 2: OUTPUTS[y] 0<=y<=1 Binary outputs: OUTPUTS[2] bits 0 and 1

5.2 Parameterizing analog modules

In this section the possible parameters will be presented in keyword form for all I/O bases.

Detailed explanations, for example range evaluation, can be found in the corresponding module descriptions in the 870 USE 002 00 manual.

5.2.1 16□input module:170 AAI 140 00

The value of the parameters of every channel must be coded into a nibble along the following pattern:

Bits 3 2 1 0	Hex value	Meaning
0 0 0 0	0	Reserved value; not to be used
0 1 0 0	4	Disabled channel
1 0 1 0	A	+/- 5 VDC
1 0 1 1	B	+/- 10 VDC
1 1 0 0	C	Disabled channel
1 1 1 0	E	4 ... 20 mA

Any other value is illegal.

When an illegal value is sent to it, the module continues to operate with the last valid parameters received.

The order of the nibbles in the parameter word is as follows:

PRM0	Channel 4	Channel 3	Channel 2	Channel 1
PRM1	Channel 8	Channel 7	Channel 6	Channel 5
PRM2	Channel 12	Channel 11	Channel 10	Channel 9
PRM3	Channel 16	Channel 15	Channel 14	Channel 13

Example

PRM0 must be initialized at 44AA hex.

Channel 1 at +/- 5 VDC
Channel 2 at +/- 5 VDC
Channel 3 disabled
Channel 4 disabled

5.2.2 4□input thermocouple module: 170 AAI 520 40

The value of the parameters of every channel must be coded into 16 bits along the following pattern:

Input range	Temperature unit	Broken wire test	Parameter Word hex
Thermocouple B	1/10 ^{0}C	disabled	2201
		enabled	2301
	1/10 ^{0}F	disabled	2281
		enabled	2381
Thermocouple E	1/10 ^{0}C	disabled	1202
		enabled	1302
	1/10 ^{0}F	disabled	1282
		enabled	1382
Thermocouple J	1/10 ^{0}C	disabled	1203
		enabled	1303
	1/10 ^{0}F	disabled	1283
		enabled	1383
Thermocouple K	1/10 ^{0}C	disabled	1204
		enabled	1304
	1/10 ^{0}F	disabled	1284
		enabled	1384
Thermocouple N	1/10 ^{0}C	disabled	1205
		enabled	1305
	1/10 ^{0}F	disabled	1285
		enabled	1385
Thermocouple R	1/10 ^{0}C	disabled	2206
		enabled	2306
	1/10 ^{0}F	disabled	2286
		enabled	2386
Thermocouple S	1/10 ^{0}C	disabled	2207
		enabled	2307
	1/10 ^{0}F	disabled	2287
		enabled	2387
Thermocouple T	1/10 ^{0}C	disabled	2208
		enabled	2308
	1/10 ^{0}F	disabled	2288
		enabled	2388

Input range	Wiring configuration	Temperature unit	Broken wire test	Parameter Word hex
IEC PT100 RTD	2 or 4 wires	1/10 ^{0}C	disabled	0A20
			enabled	0B20
		1/10 ^{0}F	disabled	0AA0
			enabled	0BA0
	3 wires	1/10 ^{0}C	disabled	0E20
			enabled	0F20
		1/10 ^{0}F	disabled	0EA0
			enabled	0FA0
IEC PT1000 RTD	2 or 4 wires	1/10 ^{0}C	disabled	0221
			enabled	0321
		1/10 ^{0}F	disabled	02A1
			enabled	03A1
	3 wires	1/10 ^{0}C	disabled	0621
			enabled	0721
		1/10 ^{0}F	disabled	06A1
			enabled	07A1
US/JIS PT100 RTD	2 or 4 wires	1/10 ^{0}C	disabled	0A60
			enabled	0B60
		1/10 ^{0}F	disabled	0AE0
			enabled	0BE0
	3 wires	1/10 ^{0}C	disabled	0E60
			enabled	0F60
		1/10 ^{0}F	disabled	0EE0
			enabled	0FE0
US/JIS PT1000 RTD	2 or 4 wires	1/10 ^{0}C	disabled	0261
			enabled	0361
		1/10 ^{0}F	disabled	02E1
			enabled	03E1
	3 wires	1/10 ^{0}C	disabled	0661
			enabled	0761
		1/10 ^{0}F	disabled	06E1
			enabled	07E1

Input range	Wiring configuration	Temperature unit	Broken wire test	Parameter Word hex
DIN Ni 100 RTD	2 or 4 wires	1/10 ^{0}C	disabled	0A23
			enabled	0B23
		1/10 ^{0}F	disabled	0AA3
			enabled	0BA3
	3 wires	1/10 ^{0}C	disabled	0E23
			enabled	0F23
		1/10 ^{0}F	disabled	0EA3
			enabled	0FA3
DIN Ni 1000 RTD	2 or 4 wires	1/10 ^{0}C	disabled	0222
			enabled	0322
		1/10 ^{0}F	disabled	02A2
			enabled	03A2
	3 wires	1/10 ^{0}C	disabled	0622
			enabled	0722
		1/10 ^{0}F	disabled	06A2
			enabled	07A2

Input range	Broken wire test	Parameter Word hex
+/ 25 mV	disabled	2210
	enabled	2310
+/ 100 mV	disabled	1211
	enabled	1311

Any other value is illegal.

When an illegal value is sent to it, the module continues to operate with the last valid parameters received by it.

5.2.3 Module 4 sorties: 170 AAO 120 00

The value of the parameters of every channel must be coded into a nibble along the following pattern:

Bits 3 2 1 0	Hex value	Meaning
0 0 0 0	0	Reserved value; not to be used
0 0 X 1	1 or 3	Reset to 0
0 1 X 1	5 or 7	Reset to full scale
1 0 X 0	9 or B	Reset to hold

Any other value is illegal.

When an illegal value is sent to it, the module continues to operate with the last valid parameters received by it.

The order of the nibbles in the parameter word is as follows:

PRM0	Channel 4	Channel 3	Channel 2	Channel 1

Example

PRM0 must be initialized at 5991 hex.

Channel 1: Reset to 0

Channel 2: Reset to hold

Channel 3: Reset to hold

Channel 4: Reset to full scale

5.2.4 Discrete/analog hybrid module: 170 AMM 090 00

Analog inputs:
The value of the parameters of every channel must be coded into a nibble along the following pattern:

Bits 3 2 1 0	Hex value	Meaning
0 0 0 0	0	Illegal or reset value
0 0 1 0	2	+/- 5V or +/- 20 mA
0 0 1 1	3	+/- 10 VDC
0 1 0 0	4	Disabled channel
1 0 1 0	A	1 ... 5V or 4 ... 20 mA

Any other value is illegal.

When an illegal value is sent to it, the module continues to operate with the last valid parameters received by it.

The order of the nibbles in the parameter word is as follows:

PRM0	Channel 4	Channel 3	Channel 2	Channel 1

Example

Input channels

Channel 1: Disabled channel

Channel 2: at +/- 5V

Channel 3: at 1 ... 5 V

Channel 4: at 1 ... 5 V

PRM0 must be initialized at AA24 hex.

Analog outputs:
The value of the parameters of every channel must be coded into a nibble along the following pattern:

Bits 3 2 1 0	Hex value	Meaning	Reset behavior
0 0 0 0	0	Illegal or reset value	
0 0 0 1	1	0 ... 20 mA	0 mA
0 0 1 1	3	+/- 10 VDC	0 V
0 1 0 0	4	Disabled channel	Disabled channel
0 1 0 1	5	0 ... 20 mA	20 mA
0 1 1 1	7	+/- 10 VDC	+10 V
1 0 0 1	9	0 ... 20 mA	Hold
1 0 1 1	B	+/- 10 VDC	Hold

Any other value is illegal.

When an illegal value is sent to it, the module continues to operate with the last valid parameters received by it.

The order of the nibbles in the parameter word is as follows:

PRM1	0	0	Channel 2	Channel 1

Example

Output channels

Channel 1: 0 ... 20 mA with reset to 0

Channel 2: 0 ... 20 mA with reset to hold

PRM1 must be initialized at 0091 hex.